In the paragraph bridging pages 18-19:

Since the separation work in a PSA process is only done in the adsorbent, the rest of the void (i.e., non-adsorbent) volumes, such as distribution pipes and adsorber headers, must be minimized for improved process performance. In conventional bed headers, a single inlet or outlet is normally used. A certain volume is needed for distributing gas flows from the inlet or outlet uniformly to the adsorbent for better use of the adsorbent and process performance. Multiple inlets or outlets can provide a better flow distribution and require less header volume. The number of inlets or outlets depends on a number of factors, for example, product flow, diameter/size of the bed, high pressure source/low pressure sink capacity, etc. If enough inlets or outlets are provided, the flow distribution header volume could be virtually eliminated and a quasi-flat header could be obtained as illustrated in Figure 2c. Compared with a conventional header, the flat header design can save up to 15-20% (and in some instances 5-10%) of the volume of a vertical bed configuration of a 150 TDP oxygen plant, and approximately 20-60% (and in some instances 10-20%) for a radial bed.

In the paragraph bridging pages 19-20:

Figure 2d shows a further non-limiting embodiment of the present invention using two flat header adsorbent beds 21 and 21' (with volumes V1 and V1', respectively) are connected to a common high pressure source 27 (i.e., compressor) and/or low pressure sink 29 (for example, a vacuum pump) by way of distributed valves. Valves 36, 36', 37 and 37' represent inlets and may be mounted immediately proximate to the inlet headers 22 and 22' (with volumes V2 and V2', respectively). Likewise, valves 33 and 33' represent outlets and may be coupled proximate to the outlet headers 24 and 24' (with volumes V3 and V3', respectively). Valves 36 and 36' are connected to common distribution pipes D6 and share a low pressure sink 29. Valves 37 and 37' are connected to common distribution pipes and share a high pressure source 27. As in the embodiment of Figure 2d, ideally the distribution pipes D5 and D6 should be maintained at either high pressure or low pressure depending on whether they are connecting the high pressure source or low pressure sink, respectively, to the vessel. The valves can provide the multiple flow inlets and outlets required by a flat header, thereby reducing the header void volume. Three-way unloading valves (38 and 39) and distributed valves can be suitably employed to close the distribution pipes to pressure changes, for example during an idle step, and maintain either high or low pressure. Therefore, the distribution pipe volume (V4 and V7) does not contribute, or contributes little to, power loss and the total void volume. In this embodiment, one high pressure source and/or one low pressure sink may be sufficient for the entire system. Alternatively, multiple high pressure sources and/or low pressure sink may be employed.

In the paragraph bridging pages 20-21:

Figure 2d also depicts silencers S1, S1', and S2 with volumes V5, V5', and V8, respectively. These silencers contribute to intermediary volume V10 (not shown) along with distribution pipe volumes V4 and V7, and other miscellaneous volumes V6 (not shown). As discussed above, V6 includes all volumes and not solely silencers, that may be situated between the inlet and the pressure source(s) or on the production (outlet) end. In accordance with the present invention, these void sources may be limited to less than 20-15% of the total volume of the total adsorbent bed volume. Figures 3a and 3b depict a radial bed configuration also suitable in the present invention. Figure 3a depicts a top view of the bed and Figure 3b depicts a side

view. Figure 3b shows a radial configuration where the high pressure source and/or low pressure sink, and valves are distributed along the circumference of the bed. In addition, the bed may be segmented (or divided, structured) as shown in Figure 4. Figure 4 depicts a segmented vertical adsorber configuration, wherein each segment functions as an individual adsorbent bed. Moreover, the beds may be very shallow and arranged in a parallel configuration where two adjacent beds (or compartments) share a common feed, evacuation and product withdrawal. The system can also be a vertical bed as shown in Figure 5.

On page 23, paragraph two:

By contrast, using the configuration disclosed in the present invention, the distribution pipes can be avoided as in Figure 2b, resulting in a reduction of the void volume to about 50%. Such a reduction increases recovery to about 25%, as indicated by case B1 in Figure 7. Furthermore, in the present invention, if two flat headers are used as shown in Figures 2c and 2d, the void volume can be reduced to a few percent of the adsorbent bed, resulting in a recovery of more than 50%, as indicated by case C2 in Figure 7. Thus, the present invention reduces cycle time while significantly improving recovery.